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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

ABRAMOWITZ, HOWARD E

ART UNIT PAPER NUMBER

1762

DATE MAILED: 06/09/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/803,949	WANG ET AL.	
	Examiner	Art Unit	
	Howard E. Abramowitz	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 April 2006.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 20-30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 September 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>9/21/04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

Claims 20-30 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 4/17/06.

Claim Objections

Claim 10 is objected to because of the following informalities: Claim 10 depends from claim 1 and refers to rotating the substrate. However, claim 1 does not include a rotating step, claim 6 does accordingly, claim 10 will be assumed to depend from claim 6 and not claim 1. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-5, 9, 11, 12, 14-17 are rejected under 35 U.S.C. 102(e) as being anticipated by Yoshio et al. (US Patent No. 6,555,158).

Referring to claim 1, Yoshio et al. discloses a method for plating a metal region on a surface of a substrate (column 1 lines 6-11), the method comprising performing a pre-plating treatment by bringing a pretreatment liquid into contact with the surface of the substrate, removing the pretreatment liquid in a rinsing step, performing electroless plating on the surface of the metal region and post cleaning (CMP) the substrate after the plating process (column 2 lines 33-44, column 8 lines 5-10 and lines 49-55). The substrate inherently is dried after removal from the CMP processing step.

Referring to claim 2-4, Yoshio et al. discloses substrate is an interconnect in a semiconductor substrate (column 1, figures 1-4).

Referring to claim 5, the pretreatment step involves simultaneously imparting a metal (palladium catalyst to activate the surface of the substrate (column 5 lines 50-67).

Referring to claim 9, the substrate can be immersed in a bath of the pretreatment liquid (figure 12, column 6 lines 17-21).

Referring to claim 11, the palladium pretreatment solution contains an acid (column 5 lines 55-67).

Referring to claim 12, the rinsing is performed with pure water (column 8 lines 5-10).

Referring to claims 14 and 15, the pretreatment, rinsing and plating are performed while discharging air pressure thus lowering the pressure below atmospheric

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reducing the amount of oxygen to levels below atmospheric (figure 10, column 7 lines 9-48).

Referring to claim 16, Yoshio et al. discloses performing a CMP procedure after the electroless plating this process can be conducted with ease (column 8 lines 49-55). The only way to know the success of the CMP procedure is to measure the resulting film thickness after the CMP procedure. Accordingly, one must inherently measure the film thickness after the CMP to know the quality of the CMP procedure.

Referring to claim 17, Yoshio et al. discloses that the substrate holder has a heater so as to supply heated fluids (column 7 lines 45-48).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

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consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-9, 11-13, 17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (US Patent No 6,699,380).

Referring to claim 1, Chen et al. discloses a substrate processing method comprising, preparing a substrate having a metal region on a surface thereof (column 1 lines 15-20), performing a pre-plating treatment a rinsing step an electroless plating process and a post cleaning the substrate after the plating process and drying the substrate (column 4 lines 10-47, column 8 lines 15-30). It does not disclose the exact order of the pretreatment steps but disclose a pretreatment and a rinsing as possible pretreatments of the substrate (column 5 lines 35-51). Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made that rinsing the substrate after performing the pretreatment would provide a clean substrate for the plating process.

Referring to claims 2-4, Chen et al. discloses that the substrate can be a semiconductor wafer with embedded interconnects (column 1 lines 15-20).

Referring to claims 5 and 11, Chen et al. discloses that any preprocessing step may be performed on the substrate including steps that enhance the plating process (column 4 lines 25-30, column 5 lines 35-51). The examiner takes official notice that it is well known in the art to perform a catalyst imparting pretreatment step to metal substrates being electrolessly plated this pretreatment step generally involves the use of

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a palladium chloride solution in an acidic aqueous solution which deposits a palladium catalyst on the substrate which enhances the plating process.

Referring to claim 6, the pretreatment or rinsing solution can be pure water (column 5 line 1), and it is ejected through a nozzle (figure 3). The surface of the substrate can optionally face downwards (column 5 lines 1-20).

Referring to claim 7, the substrate is being rotated during the pretreatment and the rinsing steps (column 5 lines 1-20).

Referring to claim 8, while the flow path system of the rinsing and the pretreatment fluid are not disclosed it would have been obvious to one of ordinary skill that the fluid leading into the nozzle from the pretreatment liquid source must flow from a different source than the rinsing fluid as the two fluids are different and must have different sources therefore the flow paths cannot be identical even if some of the same flow paths is used.

Referring to claim 9, the pretreatment liquid can completely coat the substrate (column 5 lines 1-20) thus the substrate is immersed in the fluid.

Referring to claim 12 the rinsing solution can be DI water (pure water) (column 5 lines 35-45).

Referring to claim 13, the examiner takes official notice that it is well known in the art of electroless plating to rinse the substrate with a surface active agent, reducing agent, chelating agent, complexing agent, or other component of the electroless plating bath prior to plating the substrate.

Referring to claim 17, Chen et al. does not disclose the temperatures or concentrations of the pretreatment or rinsing solutions. However it would be obvious to one of ordinary skill that the temperature must be predetermined either using a heater or not using a heater in the first case the heater would be set to a predetermined temperature in the second case the lack of a heater means the temperature was predetermined to be at room temperature. The concentration of the solution of the pretreatment liquid would obviously be chosen in the preparation of the solution.

Referring to claim 19, it would be obvious to one of ordinary skill to keep the temperature, composition and component concentrations in predetermined ranges during the plating process so that the plating proceeds at a uniform rate. It would be obvious to one of ordinary skill to stop the plating process when the thickness of the plated layer reaches its desired thickness.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. in view of Stevens et al. (US Patent No. 6,824,612).

Referring to claim 10, Chen et al. discloses all of the features of this claim as discussed above except it does not disclose the speed that the substrate is rotated at different times during the processing. Stevens et al. discloses that during the activation of a substrate for electroless plating it is desirable to rotate the substrate at relatively low speeds to facilitate even spreading of the activation solution, after the application of the activating solution the substrate can be rotated at higher speeds in order to remove any excess activating solution (column 6 lines 30-45). Accordingly, it would have been

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obvious to one of ordinary skill in the art at the time the invention was made to modify Chen et al. to use the rotational speeds suggested by Stevens et al. with an expectation that the benefits discussed above will be achieved.

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. in view of Arcilesi et al. (US Patent No. 4,814,205).

Referring to claim 18, Chen et al. discloses all of the features of the claim as discussed above except it does not disclose measuring the concentration of an impurity and removing the impurity when it reaches a certain level. Arcilesi et al. teaches that when using an activator solution it deteriorates over time as the palladium ions precipitate out of the solution (form an impurity). Arcilesi et al. teaches that when this happens the activator can be rejuvenated by addition of a ferric ion which redissolves the palladium (removes the impurity)(column 5 lines 15-30). Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Chen et al. to monitor the concentration of the palladium ions and to add ferric ions to rejuvenate the solution when the amount of Pd ions got low so as to extend the useful life of the activator solution as suggested by Arcilesi.

Conclusion


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Howard E. Abramowitz whose telephone number is 571-272-8557. The examiner can normally be reached on monday-friday 9:00-5:00.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy H. Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


HEA


TIMOTHY MEEKS
SUPERVISORY PATENT EXAMINER